A Review of Story Grammars

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Ⅰ. Introduction

The purpose of this paper is to review the studies on the narrative discourse. First, it will describe the historical background and the eventual emergence of the story grammar or story schema. Particular attention will be given to the models of story grammar developed by cognitive psychologists. The story grammar which was originally proposed by Rumelhart (1975) and its subsequent revisions will be reviewed by pointing out some of the critical drawbacks in these schemata.

Secondly, studies on children's narratives in the framework of the story grammar will be reviewed with an attempt at finding out the implications of the story grammar for the children's comprehension and production of stories.

Thirdly, some suggestions for the use of story grammars in the study of children's story *production* and some possible ways of revising the models of story grammar which are currently employed by psychologists will be made.

Ⅱ. Background

The decade of the 1970's can be characterized by attempts in linguistics to go beyond the sentential level. These attempts initially took place in semantics in which efforts were made to relate the syntactic surface structures with the underlying semantic representations. The first finding in these efforts was that there were no one-to-one correspondences between surface syntactic structures and their semantic implications. A syntactic structure often carries multiple, ambiguous meanings. At the same time, we found the reversed cases in which a number of meanings are surfaced in a single surface syntactic structure. That is, a simple sentence can be interpreted in a number of different ways depending on the situations and the mental setup of the speaker and the hearer. Thus the standard theory of *Aspects* (Chomsky 1965) had to face a significant revision in the 1970's, the result of which was the incorporation of "pragmatics" in the generative linguistic theory. As a consequence, an inversion of places of syntax and semantics was achieved. Now, semantics is considered as underlying syntax in contrast to the standard model in which syntax was the core of grammar and semantics was simply an "interpretive" component, which peripherally assigned semantic

interpretations to syntactic forms. A corollary of this revision was an expansion of linguistic perspective which went "beyond sentence" to a larger linguistic unit, that is, "discourse." A discourse is a connected speech which is composed of one or more sentences with a "thematic" unity of organization. We thus find a variety of discourses: narratives, conversations, procedures, expositions, novels, dramas, lectures, poems. The forms of discourse which have received noticeable attention in the past ten years are narratives and conversations. Studies of expositions and procedures are just beginning to emerge.

Three linguists of interest stand out conspicuously whose expertise is in discourse. They are Chafe (1970, 1972, 1979, 1980), Labov (1972; Labov and Waletzky 1967), and Longacre (1976, 1980). The studies these three linguists have done are mostly on narratives. Chafe was mainly concerned with the cognitive side of narrative. Labov's and Longacre's works were more of linguistic in nature. Both characterized the narrative in terms of action behaviors of protagonist(s) and props in the narrative. Linguistically, they characterized the narrative by the tense form of the verb, which is past. Expositions, on the other hand, were characterized by perfect and subjunctive tenses.

Labov's superstructure consists of six components: Abstract, Orientation, Complicating Action, Evaluation, Resolution (or Result), and Coda. Complicating Action is the central component of a narrative, which describes the action behaviors of participants in a temporal sequence. Abstract is a summary or gist of a narrative. Orientation encompasses the introduction of participants and the temporo-spatial contexts in which the narrative took place. Evaluation has to do with the psychological statements in a narrative which reinforce the reasons for the narrator's telling of the story, which, in a sense, help identify the narrator as an admirable hero in the narrative. Resolution is the conclusion of the narrative. Coda is a statement whose function is to bring the narrator and the listener(s) from the imaginary past "tense" of the story to the real-time present. Expressions such as "That's it" or "So I'm here telling you the story" are exemplary codas. Codas are sometimes expressed as morals or lessons which we can infer from narratives. Orientation, Complicating Action, and Resolution are the three obligatory components which are necessary for a narrative to be complete. Abstract, Evaluation, and Coda are deletable, but with some damage incurred on the narrative.

The tradition of the study of discourse is much longer in psychology than in linguistics. The precursor of all the studies of discourse in cognitive psychology was Bartlett (1932). And we can say not unreasonably that psychologists today are still in the stage where they are only elaborating on the basic notions and concepts which were initally laid down by Bartlett. The two major methodologies Bartlett employed were the "serial reproduction" and the "repeated reproduction." In the serial reproduction, a story was told to a subject and this subject retold the story from memory to

the second subject, and the second subject to the third, and down the line for a number of subjects. The version of the story which was produced by the last subject was collected. In the task of repeated reproduction, a story was told to a single subject and he retold the same story a number of times from memory with time intervals between the reproductions. Again, the final version was collected and it was compared to the final version obtained from the serial reproduction. The surprising finding from this research was that the two versions of the story turned out to show the same characteristics from which Bartlett concluded that there is some mechanism in the human minds which processes a story in the same direction. Bartlett's conclusions can be summarized in four items: (1) the recall of a story is "an active process of *reconstruction* rather than a simple reproduction," (2) the distortions found in the recalled versions of a story are not deteriorations, but rather qualitative normalizations to make the story a coherent whole, (3) the general theme or outline of a story is always remembered, and (4) the schemata, the subject's pre-existing system or systems of knowledge and beliefs, i.e., the conventional conceptual frameworks, are actively participating in the retention and/or recall of a story.

The introduction of the crucial concept of schema opened a way for the better understanding of discourse and cognition in general. In fact, the schema has become *the* cornerstone on which a large portion of studies in the discourse was built. The concept of schema has since been expanded, elaborated, and used not only in psychology and linguistics (Rumelhart 1975; Abelson 1975, 1976; Chafe 1977*a*, 1977*b*; Fillmore 1975, 1976), but also in artificial intelligence (Schank and Abelson 1975; Minsky 1974), anthropology (Bateson 1972; Hymes 1974; Frake 1977), and sociology (Goffman 1974), The nomenclatures used for the concept have also been expanded to include such terms as "script," "frame," "plan," "goal," "theme," and even "scene," besides "schema."

For the study of cognitive processes involved in the discourse—encoding, retention, and retrieval/recall of a story—the concept of schema has come to gain an utmost importance in that it has provided us with a theoretical framework which is testable. That is, the abstract concept of schema as a set of pre-existing knowledge and beliefs has become manageably formalized in the recent years.

The formalization of the story schema took two different directions. One is the schema which is represented by Kintsch and van Dijk(Kintsch 1974; Kintsch and van Dijk 1978; van Dijk 1977, 1980; van Dijk and Kintsch 1977) and the other is the one which was pioneered by Rumelhart (1975) and later revised by others (Mandler and Johnson 1977; Stein and Glenn 1979; Thorndyke 1977).

The model of story schema developed by Kintsch and van Dijk is atomistic in that their definition of proposition, the minimal semantic unit of language, is from predicate calculus, which consists of one "predicate" and one or more "arguments." A "predicate"

is an expression of relation, which is realized in a linguistic surface form of a verb, an adverb, an adjective, or a conjunction. An "argument" is an individual entity which participates in the relation or relations designated by the predicate in a specific proposition. The number of arguments which can occur in a proposition is not limited in theory. Moreover, a proposition or propositions can be embedded in an argument. For example, the sentence, "A series of violent, bloody encounters between police and Black Panther Party members punctuated the early summer day of 1969," can be analyzed into 12 propositions as given in Table 1.

Table 1. Example of propositional decomposition (from Kintsch and van Dijk 1978: 377)

Proposition no.	Proposition (Predicate, Argument)*	Proposition no.	Proposition (Predicate, Argument)
1	(Series, Encounter)	7	(Between, Encounter)
2	(Violent, Encounter)	8	(in, Encounter, Summer)
3	(Bloody, Encounter)	9	(Early, Summer)
4	(Black, Panther)	10	(Summer, Day)
5	(Panther, Party)	11	(Of, Summer day, 1969)
6	(Party, Members)	12	(Punctuated, 1-9, 10-12)

* The first element in the parentheses is the predicate and the other element or elements are arguments. In Proposition 12, each of the two arguments is made up of a number of propositions, propositions 1 to 9 making up the first argument and propositions 10 to 12, the second argument.

The text-base for Kintsch and van Dijk consists of a set of propositions, which are micro-propositions. Transformational macro-rules are applied when a person is asked to recall the text-base, the micro-structure, thus transforming it to a macro-structure. The typical macro-rules they presented are Generalization, Deletion, Integration, and Construction. Brief explanation for each is as follows.

Generalization

Example:

John was moving the *chair.*
John was moving the *table.* $\Longrightarrow$ John was moving the *furniture.*
John was moving the *chest.*

Generalization, in essence, is a rule of entailment, which says that a sequence of Σ propositions maybe substituted for by a proposition P, if P is entailed by each member of Σ. In the example above, *chair*, *table*, or *chest* entails *furniture;* the reverse of which, of course, is not true, that is, *furniture* does not entail *chair*, *table*, or *chest.*

Deletion

Example:

Mary was playing with a *blue* ball and she broke a window with the ball.

The macro-rule of deletion deletes irrelevant information. A proposition is considered irrelevant or unimportant if it is not a condition for the interpretation of another proposition. Thus, when we describe an episode in which Mary is playing with a *blue* ball and she breaks a window with it, the fact that the ball was *blue* is normally irrelevant or unimportant. Put differently, the breaking of the window is not the consequence of the "blueness" of the ball.

Integration

Example:

John went to Paris yesterday.
He took a cab to the station.
He bought a ticket.
He took the train to Paris.
$\Longrightarrow$ John went to Paris yesterday.

More specific information may be deleted by the simple fact that its global information has already been expressed in the text-base by the proposition that serves as a macro-proposition. The deletion in this case is different from the deletion of irrelevant information. Here, in integration, deletions are the results of the selection of a macro-proposition, i.e., "John went to Paris yesterday," which presupposes all the "normal" details of taking a cab, buying a ticket, and riding the train. However, if the details are not normal or conventional, they cannot be integrated by a macro-proposition. In "John fell from his chair. He broke his neck," for instance, the two propositions cannot be integrated into a single proposition of "John fell from his chair," because falling from a chair does not normally presuppose breaking a neck.

Construction

Construction is a rule which reorganizes a number of propositions on a macro-level and it also introduces new information.

According to Kintsch and van Dijk (1978), the macro-rules of integration and construction play significant roles in the recall of stories. One weakness of their model, however, is that they have not formalized the story schema in which the micro-structure/the text-base or the macro-structure/the recalled version of the story can be structurally interpreted, despite their emphasis on the importance of the story schema. The model as given today is an inductive mechanism working up from micro-propositions to macro-propositions via macro-rules. What should be complemented to their model is a deductive mechanism of the model which was developed by Rumelhart (1975) and others.

The latter model is deductive because the main concern of this model is the specification or the formalization of story schema in a form of grammatical rules. They employed the rule format of Chomskyan re-write rules (Chomsky 1965).

The basic assumption underlying the story grammar is that the grammar exists in

our minds and it is evoked when we encode, retain, or decode (or recall) a story. Moreover, the differential recalls of different structures or components/categories of a story are interpreted as reflecting the differential functions or degrees of importance of the corresponding structures or components. Thus the story grammar has become a powerful means for tapping the mental representations of stories. In the following section will be presented four models of story grammar with some mentions of drawbacks of each model.

Ⅱ. Story Grammars

1. Rumelhart (1975)

Rumelhart's (1975: 219) re-write rules for syntactic formation and semantic interpretation are given in Table 2.

Table 2. Rumelhart's rules

(1) Story ⟶ Setting+Episode
⟹ [ALLOW (Setting, Episode)]
(2) Setting ⟶ (States)*
⟹ [AND (State, State, . . .)]
(3) Episode ⟶ Event+Reaction
⟹ [INITIATE (Event, Reaction)]
(4) Event ⟶ {Episode|Change-of-state|Action|Event+Event}
⟹ [CAUSE ($Event_1$, $Event_2$) or ALLOW ($Event_1$, $Event_2$)]
(5) Reaction ⟶ Internal Response+Overt Response
⟹ [MOTIVATE (Internal Response, Overt Response)]
(6) Internal Response ⟶ {Emotion|Desire}
(7) Overt Response ⟶ {Action|(Attempt)*}
⟹ [THEN ($Attempt_1$, $Attempt_2$, . . .)]
(8) Attempt ⟶ Plan+Application
⟹ [MOTIVATE (Plan, Application)]
(9) Application ⟶ (Preaction)*+Action+Consequence
⟹ [ALLOW (AND (Preaction, Preaction, . . .), CAUSE
INITIATE ALLOW (Action, Consequence)]
(10) Preaction ⟶ Subgoal+(Attempt)*
(11) Consequence ⟶ {Reaction|Event}

* The asterisk means that the node in the parentheses may be repeated more than once.

Each rule is a pair of a syntactic rule and a semantic interpretation rule, except for Rule (6) and Rule (11), for which no explanations were given for their omissions. One of the serious defects in Rumelhart's schema is the redundancy of the semantic interpretation, which is simply a duplication of the syntactic information. The only difference between the two parts of the pair is the specification of logical relations, which are

expressed in capital letters (i.e., ALLOW, AND, INITIATE, MOTIVATE, and CAUSE). These logical relations can be better dealt with in the conventions for rule interpretation or application rather than being specified in the rule format itself, thus redundantly duplicating the same information twice. Moreover, the meanings and/or functions of the different logical relations are not justified. Except for AND, the remaining four relations are synonymous. No justifiable reasons can be found for the use of four different terms for the basically the same function which is "to make something happen."

The plus sign(+) shows that the two terms should be chosen and re-written in the order given. The vertical line between items shows that the items are alternative. In Rule (4), for instance, event is re-written as episode, change-of-state, action, or event +event. Rules (3) and (4) make up a recursive set with which an episode can be embedded into another episod as shown in Figure 1.

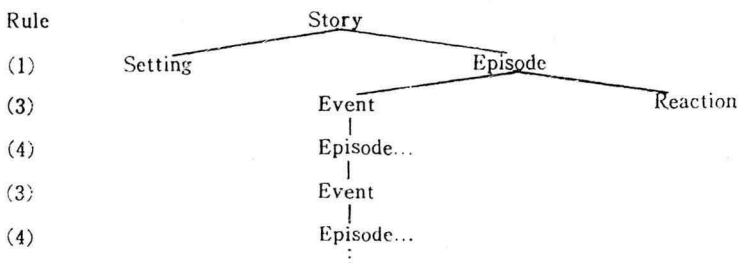

Fig. 1. Recursive set (Rules (3) and (4))

However, Rumelhart's rule schema does not allow for the coordination of episodes, represented in Figure 2, which is quite frequent in natural stories. His rules generate only the hierarchical story structures.

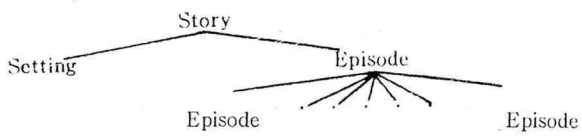

Fig. 2. Coordination of episodes, which is not possible in Rumelhart's schema

Setting aside minor questions about the schema, e.g., the use of dots, one additional point which should be mentioned is the absence of the category of "goal" in the presence of the explicitly mentioned "subgoal" in Rule (10).

2. Stein and Glenn (1979)

Stein and Glenn's (1979: 60) story grammar is a revision of Rumelhart's (1975), in which the semantic interpretations are incorporated with the syntactic formation rules.

In Stein and Glenn's grammar, the problem of ambiguity of the terms for semantic/logical relations remains, that is, the differential functions of ALLOW, MOTIVATE, and INITIATE have not been resolved.

Table 3. Stein and Glenn's rules

(1) Story ⟶ ALLOW (Setting, Episode System)

(2) Setting ⟶ State(s)
Action(s)

(3) Episode System ⟶ AND
THEN (Episode(s))
CAUSE

(4) Episode ⟶ INITIATE (Initiating Event, Response)

(5) Initiating Event ⟶ Natural Occurrence(s)
Action(s)
Internal Event(s)

(6) Response ⟶ MOTIVATE (Internal Response, Plan Sequence)

(7) Internal Response ⟶ Goal(s)
Affect(s)
Cognition(s)

(8) Plan Sequence ⟶ INITIATE (Internal Plan, Plan Application)

(9) Internal Plan ⟶ Cognition(s)
Subgoal(s)

(10) Plan Application ⟶ RESULT (Attempt, Resolution)

(11) Attempt ⟶ Action(s)

(12) Resolution ⟶ INITIATE (Direct Consequence, Reaction)

(13) Direct Consequence ⟶ Natural Occurrence(s)
Action(s)
End State(s)

(14) Reaction ⟶ Affect(s)
Cognition(s)
Action(s)

Three new logical relations, which were not found in Rumelhart's grammar, appear in Stein and Glenn's—RESULT, AND, and THEN. Again, RESULT does not differ from ALLOW, MOTIVATE, or INITIATE. In Stein and Glenn's, AND, THEN, and CAUSE function in the same location. AND represents a simultaneous or a temporal relation; THEN, a temporal but not a direct causal relation; and CAUSE, a temporal relation which is causal in nature. For instance, Rule (3) expands an episodic system into a number of episodes, in which the logical relation between any two of the episodes is AND, THEN, or CAUSE as shown in Figure 3.

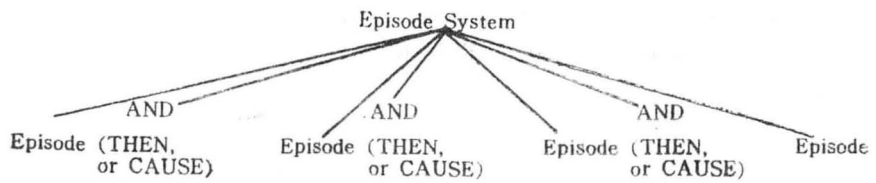

Fig. 3. Logical relations between episodes

An inconsistency in Stein and Glenn's rule format is found in the fact that they have assumed the three logical relations—AND, THEN, and CAUSE—between other subcom-

ponents other than episodes in Rule (3). For instance, the three relations are possible between a natural occurrence and an action, and between an action and an internal event in Rule (5). Despite this fact, it is only in Rule (3) that these logical relations are overtly mentioned. Rule (3) in Stein and Glenn's grammar has remedied Rumelhart's grammar by making the coordinate sequence of episodes possible. However, they did not incorporate the recursive mechanism in the grammar, which Rumelhart had in his grammar. Thus, Stein and Glenn's grammar generates coordinations of episodes, but it blocks the embeddings of episodes.

3. Thorndyke (1977)

Thorndyke's (1977: 79) grammar is another version of model which is among the revisions of Rumelhart's (1975) grammar.

Table 4. Thorndyke's rules

(1) Story ⟶ Setting + Theme + Plot + Resolution
(2) Setting ⟶ Characters + Location + Time
(3) Theme ⟶ (Event)* + Goal
(4) Plot ⟶ Episode*
(5) Episode ⟶ Subgoal + Attempt* + Outcome
(6) Attempt ⟶ {Event* / Episode}
(7) Outcome ⟶ {Event* / State}
(8) Resolution ⟶ {Event / State}
(9) {Subgoal / Goal} ⟶ Desired State
(10) {Characters / Location / Time} ⟶ State

One characteristic of Thorndyke's grammar, which makes his grammar unique, is found in Rule (1), which states four requisite components of all stories. They are setting, theme, plot, and resolution. Theme of the story, for Thorndyke, is the "general focus to which the subsequent plot adheres" (p. 80), and it contains the goal for the protagonist to achieve. The plot of the story is "an indefinite number of episodes, each of which is a cluster of actions comprising attempts to achieve the subgoal and the outcomes of these attempts" (p. 80).

Another characteristic of Thorndyke's grammar is its simplicity, which is shown by the reduced number of rules, which is ten, as compared with Stein and Glenn's 14 rules. However, the simplicity is mainly achieved by sacrificing the components for the representations of psychological cognitions, such categories as response, which include internal responses and internal plans,

The third point which is worth noticing in Thorndyke's grammar is Rule (2) for setting. He has specified three components of setting in a sequential order—character+location+time—which differ from others' grammars, in which the setting is first re-written as a sequence of states, each state then representing characters, locations, or time. Thorndyke's rule for setting, thus, can be said to represent lower-level components, i.e., components which are closer to the surface. The problem with Rule (2), however, arises as to the validity of the linear sequence of the three components. There seems to be no *a priori* reason or principle by which we could posit characters before location, and location, in turn, before time.

Fourthly, Rules (9) and (10) are *ad hoc* in that these rules re-write lower-components to higher-level categories, which contradicts the general principle of rules that rules represent a hierarchical structure of the story components. It seems that Thorndyke wanted somehow to show that each of the components of a story is intrinsically either an event or a state. However, in achieving this, he violated a more basic principle of hierarchical structure. This was caused by the fact that he formulated the higher-level rules, e.g., Rule (2), with components which are too close to the surface forms.

Finally, Thorndyke did not mention at all about the logical relations, such as AND, THEN, and CAUSE. A possible explanation for this might be that the logical relations should be dealt with in other parts of the grammar, outside the rules, possibly in terms of general conventions for the interpretations of rules. If this had been the case, he should have clearly mentioned his position.

4. Mandler and Johnson (1977)

Mandler and Johnson's (1977: 117) grammar is most complicated and has the largest number of rules, 18 in all, among the four grammars being reviewed here.

Table 5. Mandler and Johnson's rules

(1) Fable ⟶ Story AND Moral

(2) Story ⟶ Setting AND Event Structure

(3) Setting ⟶ {State* (AND Event*) / Event*}

(4) State* ⟶ State ((AND State)^n)

(5) Event* ⟶ Event (({AND / THEN / CAUSE} Event)^n)((AND State)^n)

(6) Event Structure ⟶ Episode ((THEN Episode)^n)

(7) Episode ⟶ Beginning CAUSE Development CAUSE Ending

(8) Beginning ⟶ {Event* / Episode}

(9) Development ⟶ {Simple Reaction CAUSE Action / Complex Reaction CAUSE Goal Path}

(10) Simple Reaction ⟶ Internal Event ((CAUSE Internal Event)^n)

(11) Action ⟶ Event

(12) Complex Reaction ⟶ Simple Reaction CAUSE Goal

(13) Goal ⟶ Internal State

(14) Goal Path ⟶ {Attempt CAUSE Outcome / Goal Path (CAUSE Goal Path)^n}

(15) Attempt ⟶ Event*

(16) Attempt ⟶ {Event* / Episode}

(17) Ending ⟶ {Event* (AND Emphasis) / Emphasis / Episode}

(18) Emphasis ⟶ State

Mandler and Johnson's first rule delimits their objects of study to the fable, which consists of a story and a moral. The fable is one of the typical forms of story which are usually transmitted orally from person to person, or from one generation to the next. In fact, the forms of story which are being studied by cognitive psychologists, except for Kintsch and van Dijk's, are limited to very "naively simple" story structures. There seem to be two reasons for this. One has to do with the rather short history of studies on stories that they are now only beginning to understand the basic simple structures of stories. The other has to do with the purposes of cognitive psychology that its main task is to tap human memory and its information processing. The stories, therefore, should be short in length, simple in structure, and easy to be retained in memory and thus recalled with least difficulty.

Another characteristic of Mandler and Johnson's grammar is found in their effort to specify each of the logical relations in the rules, which gievs an impression of clumsiness to the rule format. However, if the logical relations are not to be dealt with in the interpretive conventions, Mandler and Johnson's solution seems to be the best we can do at present.

Table 6. Dog Story

(1) It happened that a dog had got a piece of meat (Setting, Event)
(2) and was carrying it home in his mouth. (Setting, Event)
(3) Now on his way home he had to cross a plank lying across a stream. (Setting, State)
(4) As he crossed he looked down (Beginning, Event)
(5) and saw his own shadow reflected in the water beneath. (Beginning, Event)
(6) Thinking it was another dog with another piece of meat, (Complex Reaction, Simple Reaction, Internal State)
(7) he made up his mind to have that also. (Complex Reaction, Goal, Internal State)
(8) So he made a snap at the shadow, (Goal Path, Attempt, Event)
(9) but as he opened his mouth the piece of meat fell out, (Goal Path, Outcome, Event)
(10) dropped into the water, (Goal Path, Outcome, Event)
(11) and was never seen again. (Ending, Emphasis, State)

A simple story is given in Table 6, "Dog Story," for illustration, which is composed of 11 propositions. And this story is analyzed by Mandler and Johnson's story grammar and is shown in a tree-diagram in Figure 4 (Mandler and Johnson 1977: 120).

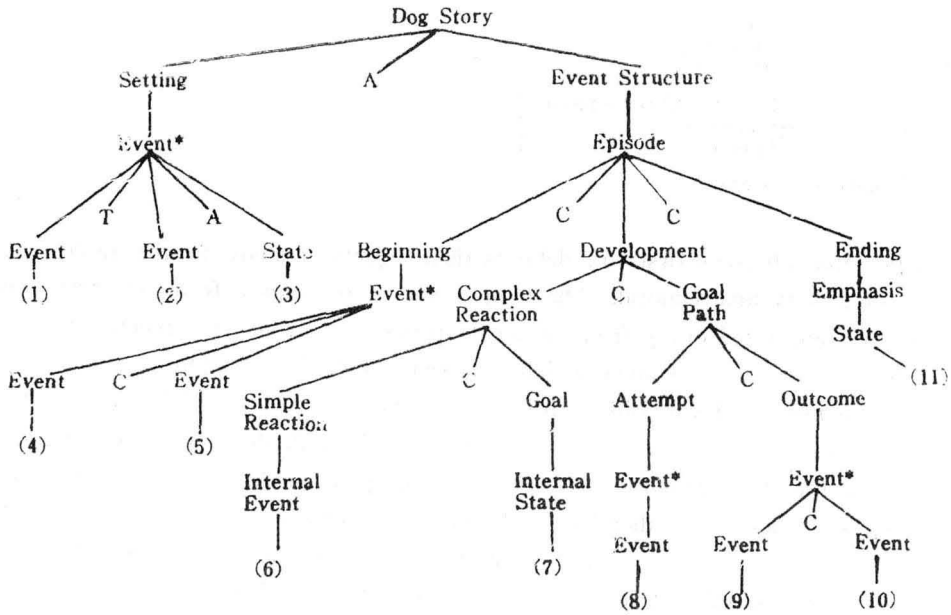

Fig. 4. Tree-diagram for Dog Story
(Numbers in parentheses show the propositions given in Table 6. Single capital letters: A=AND, T=THEN, C=CAUSE)

Looking from the propositions up in the tree-diagram, we find either an event or a state in the preterminal nodes. Only by going up further can we find the functional designation for each proposition, such as setting, beginning, simple reaction, goal, attempt, outcome, or ending. In this way, the story is represented in a hierarchical structure, beginning from an abstract level and progressing down to more and more concrete levels until each component terminates at a proposition, which is either an event or a state.

Four story grammars have been reviewed, which showed quite a wide range of diversity, even though the latter three models are the revisions of the initial model of Rumelhart's. A number of questions have been raised above as to the redundant duplications, functional properties of some components, and the rule format. In light of these questions, a reasonable conclusion could be drawn that story grammars are in a state of fluctuation. This implies that further studies are urgently necessary to arrive at a form of story grammar which can survive these criticisms.

Another aspect of the story grammar which needs our attention is the formalization of transformational rules, i.e., Kintsch and van Dijk's macro-rules, and their integration

with the re-write rules. This mechanism is necessary because we have to assume a "unique" underlying structure for stories from which the diversified surface forms of story are derived. This composite mechanism of re-write and transformational rules is also indispensable to the interpretations of recall protocols because the recalled stories are not exact replications of the given stories.

Ⅳ. Developmental Studies

Not many studies have been done on children's discourses and much less on narratives. Stein and Glenn's (1979) work, however, deserves a careful attention because this study is most extensive among the studies of its kind, which are accessible to us. They conducted two experiments with four stories. Forty-eight children participated in the first experiment, 24 each from first grade and fifth grade. The mean ages in each grade were 6;5 for first grade and 10;6 for fifth grade. The distribution of males and females is approximately even in each group. The purpose in the first experiment was to tap the recall of the stories, with the ancillary investigation of transformations, i.e., additions/deletions of information, and temporal sequencing errors in recall protocols. The recall was tested at two times, immediately after listening to the stories and one week later. Beside the obvious finding that the fifth graders recalled more story information than the first graders, there were a number of findings worth our scrutiny.

First of all, they investigated the recall protocols in terms of seven major story categories—major setting statements (the introduction of major characters), minor setting statements (the descriptions of locales and time), initiating events, internal responses, attempts, consequences, and reactions. The rank orders of the recall of the components for the four stories are shown in Table 7.

In all stories, the major setting category was the best remembered. Initiating events and direct consequences are always the next best remembered categories. The three

Table 7. Rank Orders of categories for four stories*

Component	Story 1	Story 2	Story 3	Story 4
Major Setting	1	1	1	1
Direct Consequence	2	3	2	2
Initiating Event	3	2	3	3
Attempt	4	5	4	4
Reaction	5	4	—	7
Minor Setting	6	7	6	5
Internal Response	7	6	5	6

* Ranks are integrated over grade and time because there were not significant variances between grades and between two times, except for internal response category (from Stein and Glenn 1979: 91).

categories which were least remembered were reactions, minor settings, and internal responses. And internal response and minor setting categories were always recalled in the last three positions. The only category which showed significant grade effect in all four stories was the internal response category. Fifth-grade children recalled significantly more internal responses than first-grade children. It seems to be very important to note that the goal statement, which is part of the internal response category, accounts for the majority of the recalled internal responses, whereas the proportion of recall of psychological cognitions is not high.

One interesting fact or important finding is that the analysis of additions of new information to the stories which were not included in the original stories revealed that internal responses and attempts were most frequent. Forty-one percent of all new categories added were internal responses and 37% were attempts. These added internal responses included not only the goal statements, but also a large number of cognitions, i.e., the characters' feelings and thoughts. The interpretation for this seemingly opposing results of the largest amount of newly added internal responses as against the lowest rank order of the internal responses among the recalled categories is elusive. The solution to this opposing results seems to lie in the answer to the question of whether the children's actual cognitions of internal responses are different from the stated internal responses in the stories or the children's mental mechanism of *production* of the added information is different from that of *comprehension* of given information.

Different amounts of inferences, another category of newly added information, were shown between the two grades. Across the four stories, the fifth graders produced twice as many inferences as the first graders. A typical example of the fifth-grade children's inference in one of the stories was "to cure her husband" or "to make him feel better" from "to make a medicine for her husband" in the original story. Moreover, many fifth-grade children added an inferential sentence at the end of the story to make the story more coherent. In contrast, the first-grade children added twice as many *activity* statements as fifth-grade children did. This difference in the added information between the two grades seem to show different developmental stages in their cognitive as well as linguistic abilities. Put differently, the fifth-grade children seemed to be much advanced in the abilities of comprehension and production of causal relatiens when the first-grade children's abilities are limited to the appreciation of physical activities of characters and objects.

Developmental differences were not found when the temporal organization of story recall was examined. Children's sequencing of story information matched closely the temporal sequence of categories in the original stories. Stein and Glenn (1979: 98-99) pointed out that their conclusion about the children's ability of temporal sequencing contradicted the findings of Piaget (1960), who found the children of six to eight years of age recalled temporal sequences poorly. Stein and Glenn (1979: 99) attributed this

contradiction to the differences in complexity of the different stories that were used. In addition, they emphasized the importance of causal relations to constructing an accurate temporal sequence in that when verbal descriptions in a story included such relations the ability to reconstruct the temporal sequence improved significantly in both age groups of children.

Twenty-four different children were involved in the Stein and Glenn's (1979) second experiment, 12 first graders and another 12 fifth graders. One of the tasks in this experiment was to find out what piece of information the children considered important in the stories. After hearing each story, the children were asked what he/she thought was most important information. Next, they were again asked to give his/her judgments of secondly and thirdly important statements in each story. The results of the children's first judgments are reproduced in Table 8.

Table 8. Proportions of judgment for the most important information (from Stein and Glenn 1979: 104)

Category	Grade 1	Grade 5
Minor Setting	.02	.28
Initiating Event	.20	.21
Internal Response	.29	.63
Attempt	.12	.06
Direct Consequence	.37	.17
Reaction	.02	.04

The largest proportion was attributed to the category of direct consequence by the first-grade children, whereas the category of internal response was judged most important by the fifth-grade children. The category of initiating event received either the second place or the third place in importance. As a whole, the three categories—internal response, direct consequence, and initiating event—are considered more important than other categories. These results appear to give more support to their findings about the added categories in the first experiment. However, we again have to notice the discrepancies between the order of frequencies of the recalled categories and the order of importance judgments. Major settings and initiating events, which were almost always found in the top of the recall frequencies, were included infrequently in the importance judgments. The interpretation of these discrepancies again raises a question the answer to which is not definitive.

The second task in the second experiment was to find out the children's understanding of cause-effect relations in the stories. Each child was asked to answer fifteen probe questions, all "why" questions (e.g., "why did the lady need a tiger's whisker?, Why was the lady afraid?), which could be answered only when the child could relate two

or more statements causally. The results showed that the proportions of correct answers to the probe questions did not differ significantly between the two grades of children. However, the amounts of language produced per probe question were different. Fifth graders produced significantly more statements per probe question than did the first graders (1.56 for fifth graders versus 1.06 for first graders, $p<.01$). Moreover, the qualities of language were different in that the fifth graders often connected statements with causal or temporal connectors, such as *because, so that, and then, in order to,* etc. These types of connectors almost never appeared in the first graders' responses. A large portion of the children's answers to the probe questions were made up of internal responses, either those explicitly stated in the original stories or the inferences which the children added. Furthermore, many of the internal responses that were poorly recalled in the first experiment were frequently produced in response to these probe questions by children from both age groups. This fact again brings out the repeated question about the psychological reality or state of the category of internal response.

Stein's (1979) study is a good review of the studies on children's narratives in the framework of story grammar. Included in this review are a number of studies by Stein and her colleagues, and the main conclusions in these studies are shown to be in agreement with the findings in Stein and Glenn (1979). Figure 5 (Stein 1979: 276) clearly demonstrated the differential recall proportions of different story categories by first-grade and fifth-grade children.

Mandler and Johnson (1977) conducted a recall test for 21 subjects representing children of first and fourth grades and university students. Four stories were tape-recorded and presented to the subjects. Each subject recalled two stories. The results from this study are shown in Figure 6.

The first graders formed two clusters: settings, beginnings, and outcomes were well

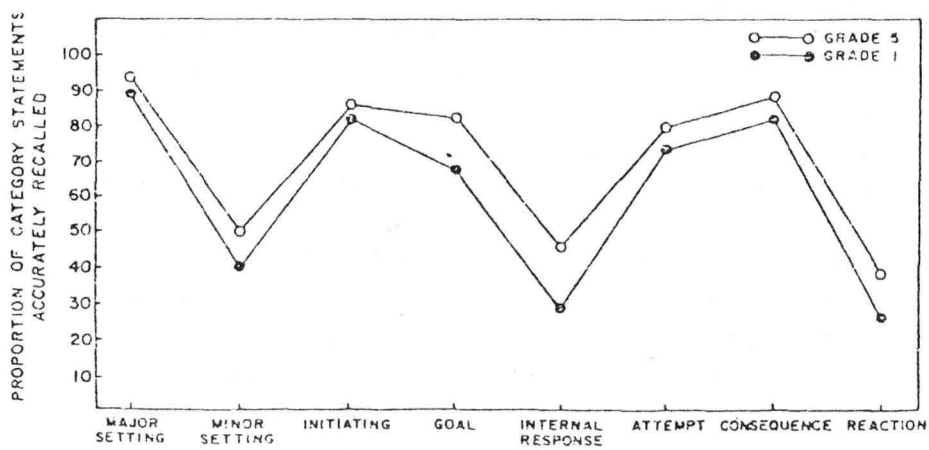

Fig. 5. Mean proportions of statement recalled from each category (from Stein 1979: 276)

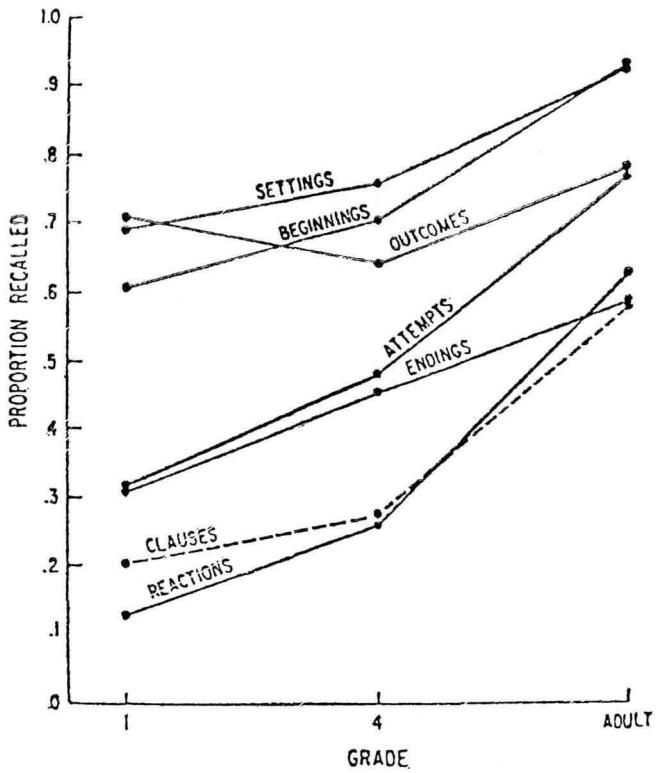

Fig. 6. Mean proportions of clauses and propositions in basic nodes recalled by first- and fourth-graders and adults (from Mandler and Johnson 1977: 144)

recalled, and attempts, endings, and reactions were poorly recalled. The fourth graders showed a similar pattern of recall, although there was no longer a significant differentiation between the recalls of attempts and outcomes. The adults recalled attempts almost as well as settings, beginnings, and outcomes. Recall of endings and reactions still lagged significantly. The only node which did not show a significant age trend was outcomes.

The main characteristic which distinguishes the story schema of children from that of adults can be found in the recall of outcomes and reactions in that children placed greater weight on outcomes than on attempts and least emphasis on reactions, whereas adults recalled attempts and reactions more frequently.

The category of "clauses" stands for "elaborative clauses," which was recalled significantly more by adults than by children. Differences between first graders and fourth graders are found in the amounts of outcomes and attempts recalled. The first graders recalled outcomes more than the fourth graders did. On the other hand, attempts were recalled more by the fourth graders. As far as the major story components are concerned, Mandler and Johnson's results did not contradict any of the conclusions

arrived at by Stein and Glenn (1979).

V. Conclusion and Prospective Studies

Four story grammars were reviewed and flaws in the grammars were pointed out. In addition, Stein and Glenn's (1979), Stein's (1979), and Mandler and Johnson's (1977) studies on children's narratives were explained.

The original purpose of the story grammar for cognitive psychologists was to use it as a theoretical framework to investigate human memory capability. Therefore, most studies which have been done since Rumelhart's (1975) story grammar came into being were for comprehension of stories, almost exclusively by means of *recall* of stories. Not much attention was given to the possibilities of using the story grammar for the study of story production, let alone serious researches. Stein and Glenn (1979: 118-19; Stein 1979) seem to be the only persons who showed an interest in the children's narrative production. Stein and Glenn's (1979) initial findings about children's spontaneous story production were as follows:

> It is assumed that the structures that influence the comprehension of stories also influence the spontaneous generation of stories. Thus, the type and sequence of categories generated in spontaneous stories should be similar to the proposed internal representation [story grammar or schema].
>
> . . . , there appear to be critical differences between story comprehension and story production. Children in first and second grade frequently generate stories that include only major and minor setting statements, e.g., descriptions of characters' physical states, activities, and recurrent desires. Older children begin to generate behavioral sequences defined in an episode but omit critical categories and relations which are critical in the development of a logical sequence of events. . . . in the former the complete logical sequence is inherent in the story, i.e., the items are prearranged. When a subject spontaneously constructs a story, the logical relationships between categories and/or episodes are often not apparent to the subject until he has begun production. In order for the story to contain a logical flow of events, many have to rework the information they have generated in order to develop all possible productions (pp. 118-119).

Stein and Glenn assumed the same story schema for both comprehension and production. The differences between the two tasks, for them, consisted in the different processes of execution of the story schema. One thing worth noticing in the quotation given above is that their task was the "spontaneous" story production, which was least controlled. As an investigation of cognitive ability of children of first or second grade, or even those of fifth or six grade, the spontaneous story production seems to be not appropriate. Unless certain controls are placed on the task of story production, rather stringent ones, the stories produced bear little or no relevance to either the cognitive capability or the children's ability of employing the story schema or schemata. Limitation on the story topic is the first possible step for control. The use of medium, e.g., pictures, can place children in a reasonable situation in which their story production could take a clearly defined direction. A sequence of logically related pictures seems to

be recommendable (Schmidt and Paris 1978). Use of toys is also thinkable, even though it may require a little higher intellect than the use of pictures (Waltz 1981). Future studies on narratives should, of necessity, include extensive research on the production of stories; it has a particular import for the developmental studies of children's language and/or cognitive growth.

The primary requisite to the production study is the construction and formalization of a new schema for stories, which is more general in nature to be applicable to the interpretations of both production and comprehension. It should contain the interpretive power for both hierarchical and coordinating story structures. A theoretical rule mechanism should be devised which could link up transformational rules to the base rewrite rules.

Certain portions of the story information, e.g., inferences and elaborations, should be dealt with, possibly by means of transformational rules, i.e., Kinsch and van Dijk's (1978) macro-rules. The functions of inferential materials and elaborative utterances are crucial in the study of stories and children's cognitive development (Kernan 1977; Johnson and Smith 1981; Reder 1980; Warren, Nicholas, and Trabasso 1979).

Another area in the study of discourse which is almost completely left unexplored is the relationship between linguistics and story structures. One of the linguistic/semantic elements which is of particular interest in the discourse study is the definite and indefinite references. A discourse from a linguistic viewpoint is a coherent whole the components of which are linked together by linguistic cohesive devices, the most important of which is the referential system via definitization and pronominalization (Hawkins 1976, 1978; Maratsos 1976; Clark and Haviland 1977; Clark and Marshall 1981; Rochester and Martin 1977; du Bois 1980; Emslie and Stevenson 1981; Prince 1981).

In addition, it is worth noting that there is a necessity of sharpening of the general knowledge and/or belief framework which delimits the boundaries of human intellectual activities. The story schema is a specific token of the general "schema/schemata" for knowledge and/or beliefs, which are intrinsically universal, but also culturally specific. (Tannen 1979; Clements 1979; Shaklee 1979; Lichtenstein and Brewer 1980). Story production and comprehension should be studied in a well-formed story schema which is reasonably constrained by system or systems of general human knowledge and beliefs.

In closing this paper, the pros and cons about story grammars should be briefed. Black and Wilensky (1979) were the first who questioned the utility or validity of story grammars in the general field of cognitive science. Their questions were immediately answered by a number of story grammarians (Rumelhart 1980; Mandler and Johnson 1980; Frisch and Perlis 1981; Mandler 1982; Stein 1982) with further support for the psychological reality of the story constituents as have been elaborated in the story grammars (Haberlandt 1980; Mandler and Goodman 1982; Bisanz 1982). Johnson and Mandler (1980) also showed a new direction in which future improvements

of story grammars could feasibly be achieved. Other criticisms of story grammars (Black and Bower 1980; Weaver and Dickinson 1982) from the camp of artificial intelligence have simply shown the necessity of exploration of different levels of human processing of information contained in discourse.

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